MERRIMACK VALLEY FLOOD CONTROL

DRAFT SPECIFICATIONS

FOR

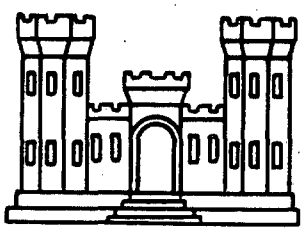
CONDUIT LINERS & SLIDE GATES

FOR

BENNINGTON DAM

BENNINGTON
NEW HAMPSHIRE

1946



CORPS OF ENGINEERS, U.S. ARMY.

U.S. ENGINEER OFFICE BOSTON, MASS.

MERRIMACK VALLEY FLOOD CONTROL

DRAFT SPECIFICATIONS

FOR

CONDUIT LINERS & SLIDE GATES

FOR

BENNINGTON DAM

BENNINGTON
NEW HAMPSHIRE

1946

CORPS OF ENGINEERS, U. S. ARMY

U. S. ENGINEER OFFICE BOSTON, MASS.

Bid No. _____ Bidder _____

(Do not write above this line)

Serial No. 19-023-47-

INVITATION FOR BIDS

(SUPPLY CONTRACT)

WAR DEPARTMENT
U. S. ENGINEER OFFICE
3d Floor, Park Square Bldg.
31 St. James Avenue
Boston 16, Mass.

Date _____

Project: Furnishing Conduit Lines and Slide Gates
Bennington Dam, Bennington, N. H.

1. Sealed bids in duplicate will be received until 11:00 A.M., Eastern Standard Time, , for furnishing all plant, labor, and materials and performing all work in strict accordance with the specifications, schedules, and drawings designated in Paragraph SC-2 of these specifications for the design, manufacture, and delivery f.o.b. railroad cars at Bennington, New Hampshire, or f.o.b. truck at project site, Bennington, New Hampshire, six (6) sets of conduit liners, twelve (12) slide gates, twelve (12) bonnets and covers, twelve (12) gate hangars, and twelve (12) hydraulic hoists.

2. Bids will be submitted in sealed envelopes upon the attached Government form of bid, and marked in the upper hand corner "Bid under Serial No. 19-023-47- to be opened , Attention: Chief, Contracts and Procurement Branch," the serial number indicating the project for which the bid is submitted. The bidder who is awarded

B.G.

the contract will be required to execute the standard Government War Department contract form for supply (W.D. Contract Form No. 1) a copy of which is attached hereto, or if not attached, a copy thereof is available at the U. S. Engineer Office designated above.

3. The right is reserved, as the interest of the Government may require, to reject any and all bids, to waive any informality in bids received, and to accept or reject any or all items of any bid, unless such bid is qualified by specific limitation.

4. Bid bond on U. S. Standard Form No. 24 (or U. S. Standard Form No. 34 - Annual Bid Bond) in 20% of the bid price will be required with each bid.

5. Bidders should carefully examine the drawings and specifications and fully inform themselves as to all conditions and matters which can in any way affect the work or the cost thereof. Should a bidder find discrepancies in, or omissions from, the drawings, specifications, or other documents, or should he be in doubt as to their meaning, he should at once notify the contracting officer and obtain clarification prior to submitting his bid.

6. Each bidder shall submit with his bid the following drawings and data:

(a) General drawings, including axial cross-sectional drawings and photographs or cuts, showing the general construction and over-all and governing dimensions of the equipment proposed.

(b) General information as to the materials to be used for the principal parts of the equipment, the convenience and methods of assembling and dismantling, and such other information as may be

B.G.

needed to show that the equipment proposed meets the requirements of the specifications.

7. The bidder may submit in his bid equipment and materials deffering from those specified, provided that differences are stated clearly in the bid and that the substitutes offered conform in all essential requirements to the equipment or materials specified. If, in the opinion of the Government, the equipment and materials offered for substitution are equal to or better for the purpose required than those specified, approval of the substitute items offered will be given consideration.

8. Each bidder shall enclose with his bid a statement of whether he is now or ever has been engaged in any work similar to that covered by the specifications herein, the year in which such work was performed and the manner of its execution, and giving such other information as will tend to show the bidder's ability to prosecute the required work.

9. Any bid which is conditioned upon the Government agreeing to the use of a price adjustment clause will be rejected.

C. T. HUNT
Colonel, Corps of Engineers
District Engineer

B.G.

Engineer Form 1448
Approved 20 Aug. 1945

Bid No.
Serial No. 19-023-47-

B I D
(SUPPLY CONTRACT)

Date: _____
(To be inserted by bidder)

To: The District Engineer
U. S. Engineer Office
3d Floor, Park Square Bldg.
31 St. James Ave.
Boston 16, Massachusetts

Project: Furnishing Conduit Liners and Slide Gates,
Bennington Dam, Bennington, N. H.

In compliance with your Invitation for bids dated _____ the undersigned hereby proposes to furnish the materials and supplies listed on the reverse hereof or on the accompanying schedule within the time specified and at the prices stated opposite the respective items, and agrees upon receipt of written notice of the acceptance of this bid or any items thereof within 60 days after the date of opening of the bids, to execute W. D. Contract Form No. 1 in accordance with the bid as accepted.

The undersigned further agrees to give bond, if required, with good and sufficient surety or sureties, for the faithful performance of the contract, within 10 days after the prescribed forms are presented for signature. If required by the invitation, security (bid bond - U. S. Standard Form No. 24) is inclosed.

Discount will be allowed for prompt payment as follows: 10 calendar days ___ percent; 20 calendar days ___ percent; 30 calendar days ___ percent; or as stated in the schedules.

B.G.

Discount time will be computed from date of the delivery of the supplies to carrier when final inspection and acceptance are at point of origin, or from date of delivery at destination or port of embankation when final inspection and acceptance are at those points, or from date correct bill or voucher properly certified by the contractor is received if the latter date is later than the date of delivery.

Note: If the bidder is a corporation indicate state of incorporation under signature, and if a partnership, give full names of all partners.

_____

By _____

_____
(Title)

_____
(Business Address)

(IF A CORPORATION, AFFIX CORPORATE SEAL)

Engineer Form No. 1449
Approved 20 Aug. 1945

B.G.

SCHEDULE

ITEM NO.	ARTICLES OR SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT DOLLARS	AMOUNT CENTS
1	Furnishing and delivering f.o.b. cars Bennington, N.H., or f.o.b. truck project site, six (6) sets of conduit liners, twelve (12) slide gates, twelve (12) bonnets and covers, twelve (12) gate hangars and twelve (12) hydraulic hoists.	1	Job	L.S.	_____	____

Bidder will indicate in which category he belongs:

Manufacturer of, or Regular Dealer in, the materials offered,

Manufacturer

Regular Dealer

Manufacturer's plant situated in what city:

City _____

State _____

Bidder _____

B.G.

Serial No. 19-023-47-
Date:

WAR DEPARTMENT
CORPS OF ENGINEERS
U. S. ENGINEER OFFICE
PARK SQUARE BUILDING
BOSTON, MASS.

PART I - STATEMENT OF WORK

SW-1. DESCRIPTION OF WORK.

(a) Work to be Done.- The contractor shall furnish all labor, materials, plant, and equipment to perform, in strict accordance with the detailed requirements of these specifications, all the work necessary to complete the manufacture, to prepare and load for shipment, and to deliver f.o.b. railroad cars at Bennington, New Hampshire or f.o.b. truck at the Project Site, Bennington, New Hampshire, six (6) sets of conduit liners, twelve (12) slide gates, twelve (12) bonnets and bonnet covers, twelve (12) gate hangers and twelve (12) hydraulic hoists.

(b) Location.- The site of the work contemplated by these specifications is located at Bennington, Hillsboro County, New Hampshire. The site of the work is approximately one-half (1/2) mile from the center of Bennington.

(c) Authority.- The work provided for herein is authorized by the Flood Control Act, approved 22 June 1936 (Public No. 738-74th Congress) and the Flood Control Act, approved 28 June 1939 (Public No. 761-75th Congress).

PART II

GENERAL CONDITIONS

(INDEX)

B.G.

GC-1. SCOPE OF WORK.- The work to be performed under this contract consists of furnishing all labor, materials, and equipment to perform the work required by Article I of the contract, in strict accordance with the specifications and drawings which are made a part hereof. The equipment furnished shall be complete, with all parts in good working order, of good materials, and with accurate workmanship, skillfully fitted, and properly connected and put together. All work, materials, and services not expressly called for in the specifications or shown on the drawings, but which are necessary for complete and proper operation of the equipment, shall be performed and furnished by the contractor at no increase in cost to the Government.

GC-2. PROTECTION OF MATERIALS AND WORK.- The contractor shall at all times take care to protect and preserve all materials, supplies, and equipment of every description (including property which may be Government furnished or owned) and all work performed. All reasonable requests of the Contracting Officer to inclose or specially protect such property will be complied with. If, as determined by the Contracting Officer, material, equipment, supplies, and work performed are not adequately protected by the contractor, such property may be protected by the Government and the cost thereof may be charged to the contractor or deducted from any payments due to him. All machinery, materials and articles in complete or incomplete state for which partial or complete payment has been made prior to delivery shall be adequately protected by the contractor from loss, and from corrosion and any and all other forms of damage.

PART III

SPECIAL CONDITIONS

(INDEX)

PART III. SPECIAL CONDITIONS

SC-1. COMMENCEMENT, PROSECUTION AND COMPLETION.- The contractor will be required to commence work under this contract within ten (10) calendar days after the date of receipt by him of notice to proceed, to prosecute said work with faithfulness and energy, and to make delivery of the items within one hundred fifty (150) calendar days after said date of receipt of notice to proceed.

SC-2. CONTRACT DRAWINGS AND SPECIFICATIONS.- Five (5) sets of contract drawings and specifications will be furnished the contractor without charge. Additional sets will be furnished on request at the cost of reproduction.

The work shall conform to the applicable portions of the following contract drawings, all of which form a part of these specifications and are available in the U. S. Engineer Office, 3d Floor, Park Square Building, 31 St. James Avenue, Boston, Massachusetts.

Merrimack Valley Flood Control
Bennington Dam
Contoocook River
4'-0" x 6'-0" Slide Gate

DRAWING NO.	DESCRIPTION
File No. M19-60/1	Assembly
M19-60/2	Conduit Liner
M19-60/3	Bonnet and Bonnet Cover
M19-60/4	Gate Leaf and Details
M19-60/5	Hydraulic Hoist
M19-60/6	Gate Hanger and Indicator

The work shall also conform to such additional drawings in explanation of details as may be furnished by the Contracting Officer from time to time during construction.

SC-3. CONTRACTOR'S DRAWINGS.- The contractor shall submit to the Contracting Officer for approval within thirty (30) calendar days after the date of receipt by him of notice to proceed four (4) copies of all shop drawings as called for under the various headings of these specifications. Before delivery of the equipment, the contractor shall furnish to the Contracting Officer 6 prints of erection drawings indicating the relationship of all match marks painted or stamped on the several parts. These drawings shall be complete and shall contain all required detailed information for assembly and erection of the equipment by others. If approved by the Contracting Officer, each copy of the shop drawings will be identified as having received such approval by being so stamped and dated. The contractor shall make any corrections required by the Contracting Officer. Three (3) sets of all shop drawings will be retained by the Contracting Officer and one (1) set will be returned to the contractor. The approval of the drawings by the Contracting Officer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the contractor of the responsibility for any error which may exist as the contractor shall be responsible for the dimensions and design of adequate connections, details and satisfactory construction of the equipment and accessories.

SC-4. BONDS.- The contractor agrees to furnish a performance bond with good and sufficient surety or sureties acceptable to the Government in connection with the performance of the work under this agreement on U. S. Standard Form No. 25 or U. S. Standard

Form No. 25-B. The penal sum of such performance bond will be 50% of the contract price.

Any bonds required hereunder will bear the same date as the contract and will be furnished by the contractor to the Government at the time the contract is executed.

SC-5. PATENT INDEMNITY.- The contractor agrees to indemnify the Government, its officers, agents, servants and employees, against liability including costs and expenses for infringement upon any Letters Patent of the United States (except Letters Patent issued upon an application which is now or may hereafter be ordered to be kept secret under the provisions of the Act of October 6, 1917, as amended, 35 U. S. C. 42) occurring in the performance of this contract or arising (in respect only of inventions which are actually embodied in items manufactured or supplied hereunder, or are involved in the use, unless there be more than one practicable use, of such items) by reason of the use or disposal of such items by or for the account of the Government.

SC-6. SHIPMENT.- (a) Material and machinery shall be furnished and delivered by the contractor f.o.b. railroad cars at Bennington, New Hampshire or f.o.b. truck at the Project Site as specified in Paragraph SW-1. The contractor shall prepare and load all material and articles for shipment in such a manner as to protect them from damage in transit, and shall be responsible for and make good any and all damage due to improper preparation or loading for shipment. Where necessary, heavy parts or machines shall be mounted on skids or shall be crated, and any articles or materials that might otherwise be lost shall be boxed or wired in bundles and plainly

marked for identification. All material shall be so loaded that it will not shift or become damaged during hauling. All parts exceeding two hundred (200) pounds gross weight shall be prepared for shipment so that slings for handling by crane may be readily attached while the parts are on the car. Boxed parts, where it is unsafe to attach slings to the box, shall be packed with slings attached to the part, the slings to project through the box or crate so that attachment to the hoisting equipment can be readily made.

(b) As soon as each shipment is made, the contractor shall furnish to the Contracting Officer shipping notices on which shall be shown, in addition to the usual data, a description of the article furnished and the item number of the contract schedule to which the article applies; also the shipping weight of each item.

(c) The Government will accept delivery of the materials and equipment whenever completed and delivered by the contractor f.o.b. railroad cars at Bennington, New Hampshire or f.o.b. truck at the Project Site, but the contractor shall notify the Contracting Officer at least thirty (30) days in advance as to the contemplated shipping dates.

(d) All crates, packages and items shall be properly tagged to indicate contents or the article. Small parts and delicate items shall be packaged. Bolts, nuts, washers and miscellaneous small articles shall be bagged or packaged. The contractor shall ship the equipment in subassemblies, marked with appropriate numbers for identification with symbols on the erection drawings, so that the equipment may be handled and placed in position by the erection contractor without the necessity of further dismantling.

SC-7. GUARANTEE.- If within one (1) year after operation of the equipment is begun, but not later than eighteen (18) months after the completion of delivery of all parts f.o.b. delivery point, any parts of the conduit liners, slide gates, bonnets and covers, gate hangers and hydraulic hoists are found defective because of design, workmanship, or material, the supply contractor shall, at his own expense, furnish replacement parts of design, workmanship and material approved by the Contracting Officer.

SC-8. FAILURE TO MEET GUARANTEES.- (a) Should any piece of equipment fail to meet the guarantees or other requirements of the contract within the time covered by the guarantee, the Contracting Officer may reject the equipment or may direct the contractor to proceed at once to make alterations or furnish new parts as may be necessary to meet the requirements. All expense of furnishing and installing new parts or making alterations to existing parts, and of tests made necessary by failure of the apparatus to meet the guarantees and other requirements of the specifications, shall be borne by the contractor.

(b) If, after due notice, the contractor should refuse or persistently neglect to correct any defects, errors, omissions, or any other failure of the apparatus to meet the requirements of the specifications which might develop during the guarantee period, the Government may proceed at its own expense to correct such defects, errors, omissions, or failures and charge the contractor an amount equal to the actual expense so incurred.

SC-9. RIGHT TO OPERATE UNSATISFACTORY EQUIPMENT.- The Government shall have the right to operate any and all apparatus as soon

as, and as long as, it is in operating condition whether or not such apparatus has been accepted as complete and satisfactory, except that this shall not be construed to permit operation of any apparatus which may be materially damaged by such operation before any required alterations or repairs have been made. All repairs or alterations required of the supply contractor shall be made by the supply contractor at such times as directed by the Contracting Officer. The repairs or alterations shall be made in such a manner and at such a time as will cause the minimum interruption in the use of the apparatus by the Government.

SC-10. SERVICE OF ERECTION ENGINEER.- (a) The installation of the equipment is not included in this contract and will be done by other agencies. The contractor shall furnish promptly upon written notice by the contracting officer, the services of a competent erection engineer to supervise and direct the erection and installation of this equipment. The services of the erection engineer will be paid for by the Government at an allowance of twenty-five dollars ($25.00) per calendar day from the time of departure from and to the time of return to his home station. Such allowance shall cover salary, travel, and living expenses of the erection engineer and any other costs occasioned by the furnishing of the service. No payment will be made for services of the erection engineer in connection with alterations to any of the equipment occasioned by failure of such equipment to comply with the requirements of the specifications.

(b) The erection and installation of the equipment by other agencies shall in no way relieve the contractor of sole responsibility for the equipment meeting all the requirements of

these specifications and fulfilling all the contractor's guaranties.

(c) The contractor shall, upon completion of the installation of the equipment, submit a written statement to the Contracting Officer certifying that the equipment has been installed properly.

SC-11. PATTERNS.- All special patterns developed for the equipment furnished under these specifications shall remain the property of the contractor. The patterns shall not be destroyed until after expiration of the guarantee period for the equipment and shall be stored at the contractor's plant. It is required that the patterns be available for immediate use, should it be necessary to replace any piece of equipment, and the Government reserves the right to make the patterns available to any equipment manufacturer designated by the Contracting Officer within the specified time. Separate payment for the patterns and for storing the patterns at the contractor's plant will not be made; all costs thereof shall be included in the contract lump sum price.

SC-12. PROGRESS CHARTS.- (a) The contractor shall within five (5) days or within such time as determined by the Contracting Officer, after date of commencement of work, prepare and submit to the Contracting Officer for approval a practicable and feasible schedule, showing the order in which the contractor proposes to carry on the work, the date on which he will start the several salient features (including procurement of materials, plant and equipment) and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart of suitable

scale to indicate appropriately the percentage of work scheduled for completion at any time.

(b) The contractor shall enter on the chart the actual progress at the end of each month, and shall immediately deliver to the Contracting Officer three (3) copies thereof. Monthly progress charts will be subject to verification by the Contracting Officer.

SC-13. FINAL EXAMINATION AND ACCEPTANCE.- (a) Final Inspection.- Final inspection will be made at the contractor's plant of all units and equipment, including all shop stock specified herein, after which all equipment and materials shall be crated and loaded on the cars in the presence of the inspector.

(b) Acceptance.- The conduit liners, slide gates, bonnets and covers, gate hangars and hydraulic hoists will be accepted at the dam site after the equipment has been installed in the dam structure by others and proven satisfactory.

SC-14. QUANTITIES.- Within the limits of available funds, the contractor will be required to complete the work specified herein in accordance with the contract and at the contract prices.

Quantity	Unit	Articles or Services
Job	L.S.	Furnishing and delivering f.o.b. railroad cars, Bennington, N.H., or f.o.b. truck at the project site, Bennington, N.H., six (6) sets of conduit liners, twelve (12) slide gates, twelve (12) bonnets and covers, twelve (12) gate hangars and twelve (12) hydraulic hoists.

SC-15. LIQUIDATED DAMAGES.- In case of the failure on the part of the contractor to make delivery of the materials or supplies within the time fixed in the contract or any extensions thereof, the contractor shall pay the Government as liquidated damages the sum of $100.00 for each calendar day of delay in making delivery.

SC-16. PAYMENT.- The contractor will be paid as follows:

(a) Ninety percent (90%) of the unit contract price of the supplies contracted for, upon submission of properly certified invoices therefor, after delivery thereof at the contractor's plant.

(b) Ten percent (10%) of the unit contract price on each unit delivered, after final tests and final acceptance thereof; but in any event, payment will be made within six (6) months after such delivery, if not rejected within such time and if the units delivered comply with the specifications in all respects other than such as are determinable only by final tests.

PART IV

TECHNICAL PROVISIONS

(INDEX)

Paragraph | Page

SECTION 3. GATES, BONNETS, HYDRAULIC HOISTS HOISTS AND GATE HANGERS

TP 1-01. MATERIALS AND WORKMANSHIP. (a) Materials. - All materials shall be of the highest grade, free from defects and imperfections, of recent manufacture and unused, and of the classification and grades designated. Material not specifically described shall, as far as practicable, conform to the latest Federal Specifications covering the class or kinds of materials to be used. If the contractor desires for any reason to deviate from the above standards, or those of the American Society for Testing Materials or American Standards Association designated in these specifications, he shall submit for the approval of the Contracting Officer a statement of the exact nature of the deviation and complete specifications for the materials which he proposes to use. All materials, supplies, and articles not manufactured by the contractor shall be the products of recognized reputable manufacturers. Names of firms specified herein are given only as criteria for the type of product desired, and products of other firms will be accepted when it is proved to the satisfaction of the Contracting Officer that they are equal in strength, durability, usefulness, and convenience for the purpose intended.

(b) Workmanship. - Workmanship shall be of the highest grade and in accordance with the best modern standard practice. Finished members shall be free from kinks, bends or winds. Shearing shall be neatly and accurately done, and all portions of the work neatly finished. Corners shall be square and true. Where approved by the Contracting Officer, flame cutting by hand torch, conforming to the applicable provisions of the current specifications of the

American Welding Society, may be used instead of shearing or sawing. Steel with welds will not be accepted except where definitely specified or called for on the plans. Tolerances, clearances and finish, where specifically mentioned in the specifications and drawings, shall be strictly adhered to. All tolerances, clearances and finish not specifically mentioned in the specifications or drawings shall be in accordance with the best modern shop practice for apparatus of the type involved, with due consideration given to the special nature of functions of the parts and to the corresponding accuracy required to secure proper operation.

TP 1-02. TESTS OF MATERIALS. (a) Tests. - All materials, supplies, and parts and assemblies thereof entering into the work to be done under these specifications shall be tested, unless otherwise directed, in conformity with Article 4 of the contract and according to the best modern approved method for the particular type and class of work. In the event the contractor desires to use standard stock materials not manufactured specifically for the work covered by these specifications, standard tests for such materials will be waived and in lieu thereof the contractor shall furnish a list of such materials, stating their intended use, the standard specification with which they conform, the manufacturer's name, and trade name for the material.

(b) Waivers. - Unless waived in writing by the Contracting Officer, all tests or trials shall be made in the presence of a duly authorized representative of the Contracting Officer. When the presence of the inspector is so waived, certified statements, in triplicate, of the tests made and the results thereof shall be furnished to the

Contracting officer by the contractor as soon as possible after the tests are made. The results of these tests shall be in such form as to provide means of determining compliance with the applicable specifications for the material tested.

(c) Specimens. - Test specimens and samples for analysis shall be plainly marked to indicate the materials they represent and, if required, they shall be properly boxed and prepared for shipment.

(d) Costs of Tests. - All costs of all tests and trials, excepting the salary and expenses of the Government inspector, shall be borne by the contractor and shall be included in the contract price.

TP 1-03. WELDING. (a) Preparation for Welding. - Members to be joined by welding shall be cut accurately to size and, where required, shall be rolled or pressed to the proper curvature in accordance with dimensions shown on the drawings. The edges of the members shall be sheared, flame-cut, or machined to suit the required type of welding and to allow thorough penetration. The cut surfaces shall expose sound metal free from laminations, surface defects caused by shearing or flame-cutting operations, or other injurious defects. The surfaces of plates to be welded shall be free from rust, grease, and other foreign matter for a distance of at least one-half (1/2) inch back from the edge of the weld.

(b) Welding. - All welding, unless otherwise specified, shall be in accordance with the current rules of the American Welding Society.

(c) Cylinder Welding. - If cylinders are of welded steel construction, all welding shall be done in the shop and the welding of both longitudinal and girth joints shall conform to the current "Rules for the Fusion Process of Welding", Class 1, of the A.S.M.E. Boiler Construction Code, Unfired Pressure Vessel Section. All joints shall be

single "V" butt-welded on automatic electric welding machines by a process that will exclude the atmosphere from the metal of the weld while it is in a molten state. The welding process and speed shall be under control at all times and there shall be no greater evidence of oxidation in the metal of the weld than in the metal of the original unwelded plate. If welding is stopped for any reason, special care shall be taken when welding is resumed to get full penetration to the bottom of the joint and thorough fusion between the weld metal and the plate and to weld metal previously deposited. The finish of the welded joint shall be reasonably smooth and free from grooves, depressions and other irregularities, and there shall be no valley at the center of the weld. If a cylinder shows irregularities after welding, it shall be rerolled to render it practically circular in cross-section.

(d) Certification of Welders. - Welders who have not been certified within two (2) years of date of contract will be required to pass successfully the tests, as prescribed by the American Welding Society, before being assigned to production work. The contractor shall bear the expense of conducting these tests and shall certify by name to the Contracting Officer welders who have successfully passed the prescribed tests. The contractor shall require any welder to repeat these tests when, in the opinion of the Contracting Officer, the work of the welder indicates a reasonable doubt of his efficiency. In such cases, the welder shall be recertified as above if he successfully passes the retest; otherwise he shall be disqualified until he successfully passes a retest.

(c) Test of Welded Cylinder Joints. - Tests of welded joints shall be made in accordance with the latest revised addenda to the A.S.M.E. Boiler Construction Code, Unfired Pressure Vessel Section, Paragraph No. U-68. Hydrostatic tests of each cylinder at test pressure of one thousand (1,000) pounds per square inch, combined with hammer tests, in accordance with Paragraph No. U-77 of the above "Code" will be accepted in lieu of X-ray tests. For the determination of the physical properties of welds of longitudinal joints, only tension and bend tests in accordance with the above "Code" will be required from full section test coupons attached to every section. The tensile strength of the joint specimen and the adjacent plate shall be not less than the minimum of the specified range of the plate used.

TP 1-04. MACHINE WORK. (a) Machine Finish. - Surfaces shall be machine-finished wherever an "f" or other mark denoting machine finish appears on the drawings and on all other surfaces, as specified herein or where necessary to insure proper fitting together of parts. All similar parts shall be interchangeable. Any part in which dimensions vary from the standard by an amount that prevents interchangeability shall be rejected. Where clearances and allowances for fits are not specified on the drawings, they shall be made in accordance with good practice for the class of work and will be subject to approval by the Contracting Officer. The quality of smoothness of finish shall be appropriate for the purpose and in accordance with good workmanship. Unworkmanlike finish will be a cause for rejection. Welding, plugging or shimming to correct defects of material of workmanship shall not be resorted to except with the full knowledge and approval of the Contracting

Officer and then only where such defects do not affect the strength or interfere with the correct functioning of the part.

(b) Unfinished Surfaces. - As far as practicable, all work shall be laid out to secure good matching of adjoining unfinished surfaces. Where there is a large discrepancy between adjoining unfinished surfaces, they shall be chipped, ground or machined to secure proper alignment. Unfinished surfaces shall be true to lines and dimensions given on the drawings and shall be chipped or ground free of all projections and rough spots. Depressions or holes not affecting the strength or usefulness of the part may, with the approval of the Contracting Officer, be welded or filled with babbitt or an approved iron cement.

(c) Protection of Machined Surfaces. - Prior to removal from the shop, all machine-finished surfaces shall be thoroughly cleaned of all foreign matter, and, except for the inside of the hydraulic hoists, coated with a composition of white lead and tallow or other approved slushing compound for protection against rust. As further protection, pins, bolts, shafting and nuts shall be wrapped with burlap to prevent removal of the coating.

TP 1-05. IRON CASTINGS. - Iron castings shall conform in all respects, unless otherwise specified or required, to Federal Specification QQ-I-652, for "Iron, Gray; Castings", Class 20 or 30, as specified. All castings after cleaning and prior to machining shall be annealed as specified therein.

TP 1-06. STEEL. - Where "Steel" only is specified, the contractor shall use a first-class grade of commercial steel best suited for the

purpose for which the part is intended.

TP 1-07. STEEL PLATES. - Steel plates for welded cylinder shells of the hydraulic hoists shall be of flange quality and shall conform to the A.S.T.M. Specification A70-44, for "Carbon-Steel Plates for Stationary Boilers and Other Pressure Vessels".

TP 1-08. STEEL CASTINGS. - Steel castings shall conform to Federal Specification QQ-S-681b, for "Steel; Castings", Class 0, unless otherwise specified or required.

TP 1-09. FORGED STEEL. - Forged steel shall conform in all respects to A.S.T.M. Specification A 266-44T, for "Carbon-Steel Seamless Drum Forgings" and shall be Grade I unless otherwise specified. All forged steel shall be annealed.

TP 1-10. BOLT STEEL (BOLTS, NUTS, STUDS, WASHERS, MACHINE AND SET SCREWS). Bolts, studs and nuts shall be of the class indicated or required, and shall conform in all respects to Federal Specification FF-B-571a, for "Bolts; Nuts; Studs; and Tap Rivets (and Material for Same)", except that threads made by rolling will not be allowed. Unless otherwise specified or required, bolts shall be of Type "B2" and nuts of Type "A2", with a Class "3" medium fit. Washers shall be furnished as specified, indicated or required. Lock washers shall be of spring steel conforming in all respects to the S.A.E. Standards for "Regular Series" lock washers. Machine and set screws shall conform in all respects to Federal Specification FF-S-91, for "Screws, Machine; (Including Screws, Set)", and shall have a medium fit, unless otherwise specified. Machine screws shall be of the type and material required and set screws shall be Type "G" unless otherwise specified.

TP 1-11. BRONZE. - Where "Bronze" only is specified for nuts, screws, studs, lock washers, pins cotter pins and tapered pins, any commercial bronze conforming to the following requirements may be used:

Tensile Strength (Min.) 60,000 pounds per square in.

Yield Point (Min.) 40,000 pounds per square in.

TP 1-12. BRONZE CASTINGS. - Bronze castings shall conform in all respects to Federal Specification QQ-B-691b, for "Bronze; Castings". All castings shall be of a composition No.6, unless otherwise or required.

TP 1-13. ALUMINUM BRONZE. (a) Rods. - Aluminum bronze for rods shall conform in all respects to Federal Specification QQ-B-666, for "Bronze, Aluminum; Bars, Plates, Rods, Shapes, Sheets, and Strips", Grade B, Type I.

(b) Castings. - Aluminum bronze castings for ston nuts shall conform in all respects to Federal Specification QQ-B-671a for "Bronze, Aluminum; Castings", Class A.

TP 1-14. MANGANESE BRONZE CASTINGS. - Manganese bronze for all castings requiring high tensile strength bronze shall conform in all respects to Federal Specification QQ-B-726c for "Bronze, Manganese; Castings, (Including Manganese-Aluminum Bronze)" Class B or C.

TP 1-15. CLASS "C" BRONZE. Class "C" bronze for seal strips for gates shall be a cast bronze made of the best grade of virgin metals, and shall have the following chemical composition:

Copper	82.00 - 83.00 percent
Tin	6.75 - 7.50 percent
Lead	4.50 - 5.00 percent
Zinc	5.00 - 6.00 percent

TP 1-16. CLASS "D" BRONZE. Class "D" bronze for seal strips for conduit liners and gate bonnets shall be a cast bronze made of the best grade of virgin metals, and shall have the following chemical compositions:

Copper	82.00 - 83.00 percent
Tin	4.75 - 5.50 percent
Lead	7.75 - 8.25 percent
Zinc	5.00 - 6.00 percent

TP 1-17. BRASS. Where "Brass" only is specified, commercial brass conforming to Federal Specification QQ-B-611a, for "Brass, Commercial; Bars, Plates, Rods, Shapes, Sheets and Strips", composition D, shall be used.

TP 1-18. RED BRASS. Red Brass for the safety stud shall conform to the following chemical and physical requirements:

(a) Chemical Composition

Copper	85 percent
Zinc	15 percent
Lead less than	.1 percent

(b) Physical Properties

Tensile Strength	48,000 - 52,000 pounds psi
Yield Point	45,000 - 49,000 pounds psi
Elongation (min)	50 percent in 2 inches

TP 1-19. COPPER SHEETS. Copper cylinder gaskets shall be made of soft copper sheets, conforming to Federal Specification QQ-C-501a, for "Copper; Bars, Plates, Rods, Shapes, Sheets and Strips".

TP 1-20. BABBITT METAL. Babbitt metal shall conform in all respects to Federal Specification QQ-M-161a, for " Metal, Anti-friction; Castings and Ingots", Grade 3. All babbitt metal shall be poured at a temperature less than 915 degrees F.

TP 1-21. WROUGHT IRON. Wrought iron for sheets shall conform to A.S.T.M. Specifications A-162-39 for "Uncoated Wrought Iron Sheets." Wrought iron for studs and rivets shall conform to A.S.T.M. Specification A-152-39 for "Wrought Iron Rivets and Rivet Rounds."

TP 1-22. PACKING. Water packing shall be similar and equal to "Garlock Chevron No. 430" and oil packing shall be similar and equal to "Garlock Chevron No. 431", all as manufactured by the Garlock Packing Co. of Palmyra, New York.

TP 1-23. RED LEAD. Red lead for red lead paint shall conform to Federal Specification TT-P-191a, for "Red Lead; Dry and Paste-in-Oil", either " dry pigment" or paste-in-oil", Grade "B".

TP 1-24. LINSEED OIL. Linseed oil shall conform to Federal Specification JJJ-O-336, for "Oil, Linseed; Raw".

TP 1-25. TURPENTINE. Turpentine shall conform to Federal Specification LLL-T-791b, for "Turpentine; Gum spirits and wood (Steam Distilled and Sulphate), (for) Paint", or LLL-T-792a for "Turpentine; Wood (Destructively-Distilled), (for) Paint".

TP 1-26. LIQUID DRIER. Liquid drier shall conform to Federal Specification TT-D-651a, for "Drier; Paint, Liquid," Type "I" or "II" as required.

TP 1-27. ENAMEL. Black enamel on the position indicator shall conform to Federal Specification TT-E-521, for "Enamel; Pigmented

(Air-Drying and Baking) Black", Type "A".

TP 1-28. LACQUER. Clear lacquer for position indicator shall conform to Federal Specification TT-L-58 for "Lacquer; Spraying, Clear and Pigmented, (General Use)", Type I.

TP 1-29. TOLERANCES AND METAL FITS. All tolerances and metal fits shall be in accordance with the American Standard B4a-1925, for "Tolerances, Allowances, and Gages for Metal Fits". The terminology used on shop drawings to describe the class of fit for mating parts shall be in accordance with the classification given in the American Standard, and all parts so described shall be machined to the limits specified therein.

SECTION 2. CONDUIT LINERS

TP 2-01. GENERAL. - The Contractor shall furnish and deliver six (6) sets of conduit liners complete. Each set shall consist of one (1) upstream unit and one (1) downstream unit, together with all necessary appurtenances as shown on the drawings or as called for in these specifications.

TP-2-02. CONDUIT LINERS. - Sections of the conduit liners (for the four foot by six foot (4'-0" x 6'-0") conduits) shall be constructed as shown on the drawings of Class 20 cast iron as specified in paragraph TP 1-05. The flanged faces of the conduit liners shall be accurately machined so that the respective faces when assembled shall be in the same or parallel planes and will bear uniformly on each other. All bolts shall be furnished by the contractor. The interior surfaces of the liners on assembly shall match within one eighth (1/8) inch at any point, after which all offsets shall be ground flush to a bevel of one on six (1/6) as shown on the drawings. The conduit liners and gate bonnets shall be fitted up and matchmarked before they are prepared for shipment.

TP 2-03. SEAL STRIPS. - The seal strips on the conduit liners shall be constructed of Class "D" bronze as specified in paragraph TP 1-16. The recesses provided in the gate sills shall be filled with babbitt, which shall be thoroughly peened after pouring and then machined. All bearing seats shall be coated with a thin coat of white lead paste mixed in linseed oil, and all guides and seals shall be assembled on their bearing seats in castings and the screws locked

to prevent loosening. Seal Screws shall be fabricated of bronze of the same hardness as specified for the seal strips. After attaching the seal strips, the sliding surfaces shall be machined to a true plane surface.

SECTION 3. GATES, BONNETS, HYDRAULIC HOISTS AND GATE HANGERS.

TP 3-01. SCOPE. - The contractor shall furnish and deliver twelve (12) slide gates, twelve (12) bonnets, twelve (12) bonnet covers, twelve (12) hydraulic hoists and twelve (12) semi-automatic gate hangers, all complete and as shown on the drawings. The gates will be subjected to a hydrostatic head of fifty (50) feet. Operation will be by means of hydraulic cylinders using oil as a medium, with a maximum operating pressure of five hundred (500) pounds per square inch. The furnishing of air vents, oil pumps and control piping is not included under this contract.

TP 3-02. GATES. - The gates shall be constructed as shown on the drawings of Class 30 cast iron as designated in paragraph TP 1-05. The seal strips on the gate shall be constructed of Class "C" bronze as specified in paragraph TP 1-15. Seal strips shall be attached and machined as specified in paragraph TP 2-03 for seal strips for conduit liners. Seal screws shall be fabricated of bronze of the same composition and hardness as specified for the gate seal strips. The wrought iron sheet shall be attached to the upstream face of the gate as shown on the drawings.

TP 3-03. BONNETS AND BONNET COVERS. - The gate bonnets and bonnet covers shall be constructed as shown on the drawings of Class 30 cast iron as specified in paragraph TP 1-05. Bonnets and bonnet cover surfaces in mutual contact or in contact with other surfaces shall be smooth, accurately machined, and perfectly matched to the respective contact surface. The joint between the bonnet and bonnet cover shall be doweled as shown, and shall be watertight under a pressure of forty (40) pounds per square inch. The seal strips in the bonnet cover shall

be Class "D" bronze. Seal strips shall be attached and machined as specified in paragraph TP 2-03 for seal strips for conduit liners.

TP 3-04. HYDRAULIC HOISTS. - (a) Cylinders. - The shells of the hoist cylinders shall be made of pierced and rolled steel forgings or from flat steel plates rolled to cylindrical shape and welded. The outside surface shall be rough-machined before boring and finishing, and sufficient stock shall be provided so that, after machining inside and outside, the wall thickness of the shell will not be less than that shown on the drawings. The cylinders shall be bored to true circles with permissible tolerances as shown on the drawings, with the inside surface ground or honed to a polished surface. Cylinders with a variation of 0.01 inch more or less than the nominal diameter will be accepted provided the tolerances specified are not exceeded. The flanges shall be of forged steel, and shall be butt-welded to the cylinder shells. If the cylinders are forged, the flanges may be forged as integral parts of the cylinder. After forging or welding and before machining, the cylinders shall be annealed by heating to approximately twelve hundred degrees (1200°) F. at which temperature they shall be held for four (4) hours before cooling slowly. Flange faces shall be finished at right angles to the bore. Before final machining, each cylinder shall be subjected to a hydrostatic test pressure of one thousand (1000) pounds per square inch, and under this pressure there shall be no trace of leakage through the welded joints.

(b) Cylinder Heads. - The cylinder heads shall be made of Class 30 cast iron as specified in paragraph TP 1-05.

(c) Pistons and Piston Rings. - The hoist cylinder pistons shall be made of Class 30 cast iron, as specified in paragraph TP 1-05, and shall be installed and connected to the gate stems as shown on the drawings. The pistons shall be equipped with five (5) piston rings each. The piston rings shall be of cast manganese bronze, as specified in paragraph TP 1-14. The pistons and rings shall be accurately machined to provide suitable clearances in accordance with the best standard practice.

(d) Packing Glands, Seats and Packing. - Packing glands and seats shall be of bronze as designated in paragraph TP 1- 11. Packing rings shall be made up of V-section individual rings with top and bottom adapters for flat seats, similar and equal to Garlock Chevron packing as specified in paragraph TP 1-22. Packing for cold oil shall be provided for in the cylinder head and top of bonnet cover and cold water packing shall be provided for the in the bottom of the bonnet cover.

TP 3-05. PISTON ROD. - The piston rod and piston rod extension shall be of aluminum bronze as specified in paragraph TP 1-13 (a). Piston rod nuts shall be of cast aluminum bronze as specified in paragraph TP 1-13(b). The shafts shall be specially straightened to within 0.010 inch, round, of uniform cross-section, and shall have a smooth, polished piston-finish.

TP 3-06. SEMI-AUTOMATIC GATE HANGERS. - The semi-automatic gate hangers shall be constructed of the materials as shown on the drawings.

TP 3-07. POSITION INDICATOR. - Each slide gate shall be equipped with a mechanical position indicator consisting of the parts shown on

the drawings. The gage support shall consist of structural steel angle securely fastened to both flanges of the cylinder. The gage pointer shall be made of brass. Figures on the gage shall be recessed and filled with black enamel. Pointer shall be enameled black. Brass gage face shall be polished and given three (3) coats of a clear lacquer.

TP 3-08. SHOP TESTS. - Before assembling the hoist on the bonnet cover, the cylinder and piston assembly shall be tested under a hydraulic pressure of one thousand (1000) pounds per square inch on one side of the piston. The piston shall be securely held in place in the cylinder, with the piston rod hole blocked and the cylinder head bolted in place. There shall be no leakage past the piston under this test. The fluid used shall be lubricating oil having a viscosity of 210 to 240 Saybolt at a temperature of one hundred (100) degrees F. Each unit consisting of the conduit liner, bonnet, bonnet cover, gate and hydraulic hoist shall be completely assembled at the shop for shop inspection and to insure that all parts fit accurately and are in proper alignment. Each gate shall be opened and closed at least three (3) times by means of the hydraulic hoist to insure that the gate functions properly and to the satisfaction of the contracting officer. During these tests, the working pressure in the cylinder shall not exceed fifty (50) pounds per square inch. Tests for leakage around the gates shall be made by applying a jet of water under a pressure of sixty (60) pounds per square inch to the joints and seals. Gates shall be watertight.

TP 3-09. TOOLS AND SPARE PARTS. - The contractor shall furnish a spanner wrench, for each size of piston rod nut, made of forged steel; and two (2) complete sets of open end wrenches of chrome-vanadium steel to fit all nuts on the cylinders and bonnet covers. The contractor shall also furnish twenty-four (24) additional copper gaskets for the cylinders, twelve (12) additional safety studs, and two (2) additional sets of water and oil packing.

TP 3-10. SHIPPING ASSEMBLY. - Each unit shall be shipped in the following manner:

(a) Entire unit consisting of one (1) unit of conduit liner, bonnet, bonnet cover, gate and hydraulic hoist shall be completely shop assembled and shipped.

(b) The semi-automatic gate hangers and the gate position indicators shall be shipped as separate units. The gate hangers shall be shipped as assembled units.

TP 3-11. PAINTING. - After shop inspection has been completed, the outside of the hoist cylinders and cylinder heads, inside and outside of the bonnet covers except the machined surfaces, and the edges of the top flanges of bonnets shall be thoroughly cleaned of all scale, rust, dirt, oil, grease and other foreign material and given one (1) shop coat of red lead paint.